

(19)



(11)

EP 1 006 882 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
25.11.2009 Bulletin 2009/48

(51) Int Cl.:
A61B 8/02 (2006.01) A61B 5/107 (2006.01)
A61B 8/08 (2006.01)

(21) Application number: **98919447.7**

(86) International application number:
PCT/IL1998/000208

(22) Date of filing: **04.05.1998**

(87) International publication number:
WO 1998/049942 (12.11.1998 Gazette 1998/45)

(54) METHOD AND APPARATUS FOR MONITORING THE PROGRESS OF LABOR

GERÄT ZUR ÜBERWACHUNG DER ENTWICKLUNG VON WEHEN

PROCEDE ET DISPOSITIF SERVANT A CONTROLER L'EVOLUTION DU TRAVAIL PENDANT
L'ACCOUCHEMENT

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI NL
PT SE**

(30) Priority: **05.05.1997 US 45556 P**

(43) Date of publication of application:
14.06.2000 Bulletin 2000/24

(73) Proprietor: **TRIG Medical Ltd.
Haifa 34987 (IL)**

(72) Inventor: **Paltieli, Yoav
Haifa 34602 (IL)**

(74) Representative: **Zimmermann & Partner
Postfach 330 920
80069 München (DE)**

(56) References cited:
DE-A- 3 103 367 FR-A- 2 158 767
US-A- 3 768 459 US-A- 5 088 497
US-A- 5 222 485 US-A- 5 438 996

EP 1 006 882 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

FIELD AND BACKGROUND OF THE INVENTION

[0001] The present invention relates to an apparatus for monitoring the progress of labor during childbirth.

[0002] Normal labor is generally divided into three stages: The first stage begins with the onset of labor and ends when dilatation of the cervix is complete; the second stage begins at that point and ends with the complete birth of the baby; and this is followed by the third stage which ends with the delivery of the placenta. During labor it is common to use either an external Ultrasonic system for recording the baby's heart rate, and an external system for detecting the mothers uterine contractions, or an electronic system to sense the baby's heart pulses by an electrode attached to the baby's head and the mother's contractions by a pressure catheter applied to the mother inside the uterus.

[0003] However, a number of other physiological conditions of the mother and baby during labor must also be monitored in order to determine the progress of labor. These additional conditions include: (1) effacement (the thinning out of the cervix that occurs before and during the first stage of labor); (2) cervical dilatation (the increase in size of the cervical opening); (3) position of the cervix (the relation of the cervix to the vaginal axis, normally the fetal head); and (4) station (the level of a predetermined point of the fetal presenting part with reference to the mothers pelvis). The more common determination of station is the distance between the tip of the fetal head and the ischial spines which can be palpable by the physician; but a more accurate determination of station is the distance between the bi-parietal diameter (BPD) of the fetal head and the mother's pelvic inlet.

[0004] The foregoing conditions are generally determined by a physical examination. i.e., by the insertion of a finger through the mother's vagina. However, the accuracy of such a "finger" examination is very subjective and depends to a great extent on the experience, Judgment, and even finger size, of the physician. Other drawbacks in such a physical examination are that it can be done only at spaced intervals, it generally produces discomfort to the mother, and it involves a number of risks including contamination, infection, dislodgment of a fetal monitor, injury to the baby, etc. Failure to interpret the precise stage of the labor progress from the physical examination can result in injury or even death of the baby or of the mother.

[0005] Many devices have been proposed in the past for automatically monitoring these conditions. As examples, US Patent 4,476,871 proposes an elongated tube having electrodes spaced along its length to monitor cervical dilatation during labor; US Patents 4,942,882 and 5,135,006 propose a fetal monitor probe attached to the fetal head to monitor heart beat, which probe is calibrated to monitor progress of descent; US Patent 5,222,485 proposes an elongated inflatable sac to monitor the position

of the fetus and the configuration of the cervix; and US Patent 5,406,981 proposes a pessary to monitor the configuration of the cervix. However, for one reason or another, none of the previously proposed devices has come into any widespread use, and the historical "finger" examination continues to be the one in common use to this day.

[0006] DE 31 03 367 A1 describes an apparatus for determining cervical dilatation by using a transmitter probe and a reception probe both of which are placed on opposite sides of the cervical opening. By using a transmitter probe and a reception probe, the distance between these two probes can be determined.

[0007] US 5 438 996 discloses an apparatus for monitoring cervical dilatation by using an ultrasonic transmitter and an ultrasonic preceptor which both are secured to the wall of the cervix uteri of human female at spaced apart positions so that a straight line ultrasonic acoustic path exists between them. Similar to DE 31 03 367 A1, US 5 438 996 uses a transmitting probe and a reception probe to determine the distance between these two elements.

[0008] A transmitter probe and a reception probe are also used in FR 2 158 767 A for measuring the cervical dilatation. Again, these probes are placed one the cervical opening.

[0009] The same is true for document US 3 788 459 which also deals with the measurement of cervical dilatation by using a transmitting device attached to one side of the cervix and a receiving device attached to an opposite side of the cervix.

OBJECTS AND BRIEF SUMMARY OF THE INVENTION

[0010] An object of the present invention is to provide an apparatus having advantages over the conventional "finger" examination technique for monitoring the progress of labor in a mother during childbirth.

[0011] In view of the above, an apparatus according to claim 1 is provided. The apparatus can be used for monitoring the progress of labor in a mother during childbirth, by attaching a position sensor to a predetermined point on the mother's pelvic bones: Monitoring the location of the position sensor in three-dimensional space relative to a reference; and monitoring the location of the fetal presenting part with respect to the predetermined point on the mother's pelvic bones to provide an indication of the progress of labor.

[0012] Three embodiments of the invention are described below for purposes of example. In one embodiment, the location of the fetal presenting part, and also of the opposite sides of the end of the mother's uterine cervix, are monitored by position sensors attached to these respective elements. In a second described embodiment, the latter are monitored by operating an ultrasonic transducer to image the mothers cervix and pelvic bones, and the fetal head, on a screen, and by using a

position sensor on the ultrasonic transducer, and a marker for marking the screen, to locate the positions of these elements. A third embodiment is described utilizing both the four position sensors applied to the mother and the fetal presenting part, and a fifth position sensor applied to an ultrasonic transducer for imaging and locating the mother's cervix and pelvic bones and the fetal head

[0013] According to further features in the described first and third embodiments, the cervical dilatation of the mother's cervix is continuously indicated by continuously monitoring the positions of the position sensors applied to the opposite sides of the end of the cervix, and continuously displaying the spatial distance between them. The position of the fetal presenting part (e.g., fetal head) is also continuously indicated by continuously monitoring and displaying their respective locations.

[0014] According to further features in the described preferred embodiments, the above conditions are computed and displayed in the form of units of distance (e.g., cm), and/or in the form of a graph, called a Partogram, showing the interrelation of the cervical dilatation and the descent of the fetal presenting part

[0015] The output device of the apparatus is preferably a display, but could be a plotter, recorder, or other device for displaying, recording, and/or processing the data outputted by the computer.

[0016] As will be described more particularly below, such an apparatus permits the progress of labor to be monitored in a manner which is continuous rather than intermittent, which is less dependent for accuracy on the experience, judgment or finger size of the attendant in the conventional "finger examination", which subjects the mother to less discomfort, and which involves less risk of contamination, infection, dislodgment of a fetal monitor, or injury to or death of the baby or mother due to a wrong assessment of the fetal position or of labor progress. Moreover, this technique enables more precise monitoring of the critical condition, namely the changes in the spatial distance of the BPD of the baby's head with respect to the pelvic inlet.

[0017] Further features and advantages of the invention will be apparent from the description below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

Fig. 1 is a block diagram illustrating one form of system constructed in accordance with the present invention;

Fig. 2 illustrates one of the position sensors in the system of Fig. 1;

Fig. 3 is a block diagram of one type of position sensor system that may be used;

Fig. 4 more particularly illustrates the Partogram display in the system of Fig.1;

Fig. 5 is a block diagram illustrating an imaging system for displaying the image of the mother's womb, particularly the cervix, pelvic bones, and the fetal head to better show the progress of the labor;

Figs. 6A - 6D illustrates typical displays produced by the system of Fig. 5 during the various stages of labor;

Fig. 7 illustrates a typical display produced by the system of Fig. 5 during the descent of the fetal head; Fig. 8 illustrates how the monitored data may be processed to display the changes in the spatial distance of the BPD of the baby's head with respect to the mother's pelvic inlet; and

Fig. 9 illustrates a fetal heart monitoring display and uterine contractions that may be included in the above-described systems of Fig. 1 or Fig. 5.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0019] Fig. 1 schematically illustrates the mother's womb particularly illustrated in Fig. 4, is of special value since it provides a visual display of the progress of labor and can be recorded if desired. By using the Partogram, a better determination can be made whether labor is progressing normally. "Alert" and "action" lines may be printed on the Partogram to provide a visible indication of whether labor is progressing normally or abnormally, and thereby to better alert the attending personnel to take prompt action if necessary. Such an "electronic Partogram" can also markedly reduce the number of prolonged labors, the rate of intrapartum, post partum and early neonatal infections, the number of unnecessary interventions, and neonatal trauma due to wrong assessment of the fetal head.

[0020] Fig. 5 illustrates a monitoring system similar to that of Fig. 1 but further equipped with an imaging system for imaging the womb area of the mother and for continuously displaying the mother's cervix, pelvic bones, and fetal head (or other presenting part).

[0021] Thus, Fig 5 includes an ultrasonic transducer 40 for imaging the womb area, via the computer 12, on an image display 42. It also includes a position sensor PS5 attached to the ultrasonic transducer 40. Thus, any point in the image on display 42 may be selected by a marker device 43, such as a mouse or touch screen, and its location fed into the computer 12 to identify the location of the respective point with respect to the location of position sensor PS1 attached to the mother's pubic bones. With this information, the computer 12 can compute the various relationships displayed in displays 14 and 16. The image displayed in display 42 may be used in the same manner for marking the BPD on the fetal head as illustrated in Fig 8, thereby enabling particularly the spatial distance between the fetal BPD and the pelvic inlet to be computed and monitored.

[0022] It will be appreciated that other reference points, other than the BPD or the tip of the fetus head, as well as any other point of the mother's pelvis, may be used

as the reference points for monitoring the progress of the labor. This freedom is important because of the variety of preferences among various physicians.

[0023] The imaging system illustrated in Fig. 5 could also be used to provide a visual image of the various stages of labor, e.g., as illustrated in Figs. 6A - 6D showing the progressive dilatation and effacement of the cervix, or as illustrated in Figs. 7 and 8 showing the progressive descent of the fetal head tip through the various stations with respect to the ischial spines 7 (Fig. 7) or mother's pelvic inlet (Fig. 8).

[0024] If the imaging system is used together with all five position sensors PS1-PS5 illustrated in Fig. 5, the ultrasound imaging may be used only to measure the BPD at the beginning of labor or later. The computer then determines the distance between the BPD and the tip of the fetal head, and thereafter it can use the position of the tip of the fetal head also to determine the BPD position. The ultrasound imaging may thereafter be used only for verification if desired. It can also be used to verify cervical dilatation and effacement.

[0025] The system illustrated in Fig. 5 may also be used for sensing contractions in the mother's uterus. Thus, during contractions, the fetal head moves slightly, and the dilatation also grows slightly; and after contractions, they both retract to their previous positions. By thus observing the fetal head position and preferably the dilatation as a function of time, the attending physician may discern the occurrence of contractions as well as the duration and strength of such contractions. In addition, by including a heart pulse sensor in the fetal head position sensor PS2, the physician may observe the relation of the fetal heart rate (FHR) in relation to the uterine contractions (UC), to show the relationship between the two as illustrated in Fig. 9. Computer 12 may be programmed to receive the above information from the various sensors and produce, in a monitor 45, a display corresponding to the fetal heart rate (FHR) in relation to the uterine contractions (UC), as illustrated in Fig. 9. Such information is particularly desirable if the presence of complications is established or anticipated.

[0026] While separate displays are shown in the drawings, it will be appreciated that these displays could be in the form of windows on the same large computer display.

[0027] While the invention has been described with respect to several preferred embodiment, it will be appreciated that these are set forth merely for purposes of example, and that many other variations, modifications and applications of the invention may be made.

Claims

1. Apparatus for monitoring the progress of labor, characterized by:

a position sensor (PS1) for attachment to a pre-

determined point on the mother's pelvic bones, and for producing an output signal identifying its location in space;

means (PS2) for sensing the location of the fetal presenting part (4) with respect to said predetermined point on the mother's pelvic bones, and for producing an output signal identifying the location of said fetal presenting part (4); wherein said means for sensing the location of the fetal presenting part (4) with reference to said predetermined point of the mother's pelvic bones comprises a second position sensor (PS2) for attachment to the outer tip of the fetal presenting part for producing an output signal to the computer (12) identifying the location of said second position sensor (PS2);

a computer (12) connected to receive said output signals; and

an output device (42) controlled by said computer (12) for outputting the position of said fetal presenting part (4) with respect to said predetermined point of the mother's pelvic bones, wherein said

means for sensing the locations of the fetal presenting part (4) and of the opposite sides of the mother's uterine cervix comprises:

an ultrasonic transducer (40) to image said fetal presenting part (4) and uterine cervix on a screen (42); and

a position sensor (PS5) attached to said ultrasonic transducer (40) for producing an output signal identifying its location to the computer (12);

and said apparatus further comprises: a marker device for marking a selected point of the fetal presenting part (4), and the opposite sides of the mother's uterine cervix, as imaged on the screen (42), and for outputting electrical signal identifying their respective locations to the computer (12).

2. The apparatus according to Claim 1, further comprising means (PS3, PS4) for sensing the locations of the opposite sides of the mother's uterine cervix with reference to each other to produce output signals which are received by said computer (12) and processed to control said output device (42) for outputting an indication of the dilatation of the mother's cervix.

3. The apparatus according to Claim 2, further comprising means (PS3, PS4) for sensing the locations of the opposite sides of the mother's uterine cervix with reference to the fetal presenting part (4) and the mother's pelvic bones to produce output signals which are received by said computer (12) and processed to control said output device (42) for outputting

an indication of the cervical position of the mother.

4. The apparatus according to Claim 2 or 3, wherein said means for sensing the locations of the opposite sides of the mother's uterine cervix include third (PS3) and fourth (PS4) position sensors for attachment to the opposite sides of the mother's uterine cervix and for producing output signals to the computer (12) identifying their respective locations. 5
5. The apparatus according to Claim 4, wherein said computer (12) computes, and said output device (42) displays, the station of the fetal presenting part (4) as the spatial distance between said first (PS1) and second (PS2) position sensors. 15
6. The apparatus according to Claim 5, wherein said computer (12) computes, and said output device (42) displays, the cervical dilatation of the woman's cervix as the spatial distance between said third (PS3) and fourth (PS4) position sensors. 20
7. The apparatus according to Claim 6, wherein said computer (12) computes, and said output device (42) displays, said cervical dilation and said station in centimeters. 25
8. The apparatus according to Claim 6, wherein said computer (12) computes, and said output device (42) displays, said cervical dilatation and said station in the form of a Partogram showing the interrelation of the cervical dilatation and the descent of the fetal presenting part (4). 30
9. The apparatus according to any one of Claims 4 to 8, wherein said computer (12) computes, and said output device (42) displays, the effacement of the mother's cavity as the spatial distance of said second position sensor (PS2) from said third (PS3) and fourth (PS4) position sensors. 35
10. The apparatus according to any one of Claims 4 to 9, wherein said computer (12) computes, and said output device (42) displays, the position of the mother's cervix as the spatial distances between said first (PS1), second (PS2), third (PS3) and fourth (PS4) position sensors. 40
11. The apparatus according to Claim 10, wherein said effacement and position of the mother's cervix are computed and displayed in centimeters. 45
12. The apparatus according to any one of Claims 4 to 9, wherein said computer (12) computes, and said output device (42) displays, the angle of the cervical axis as indicated by said second (PS2), third (PS3) and fourth (PS4) position sensors. 50

13. The apparatus according to Claim 12, wherein when said marker marks the bi-parietal diameter (BPD) of the fetal head (4) as imaged on the screen (42), said computer (12) computes the distance between said BPD and the mother's pelvic inlet. 55

Patentansprüche

1. Vorrichtung zum Überwachen der Entwicklung von Wehen, **gekennzeichnet durch:**

einen Positionssensor (PS1) zum Befestigen an einen vorher festgelegten Punkt auf den Hüftknochen der Mutter, und zum Erzeugen eines Ausgangssignals, das seinen Ort im Raum identifiziert;

ein Mittel (PS2) zum Erfassen des Ortes des vorangehenden Teils (4) des Fötus bezüglich des vorher festgelegten Punkts auf den Hüftknochen der Mutter, und zum Erzeugen eines Ausgangssignals, das den Ort des vorangehenden Teils (4) des Fötus identifiziert, wobei das Mittel zum Erfassen des Ortes des vorangehenden Teils (4) des Fötus bezüglich des vorher festgelegten Punkts auf den Hüftknochen der Mutter einen zweiten Positionssensor (PS2) zum Befestigen an der äußeren Spitze des vorangehenden Teils (4) des Fötus zum Erzeugen eines Ausgangssignals an den Computer (12), welches den Ort des zweiten Positionssensors (PS2) identifiziert, umfasst;

einen Computer (12), welcher angeschlossen ist, um die Ausgangssignale zu empfangen; und ein von dem Computer (12) gesteuertes Ausgabegerät (42) zum Ausgeben der Position des vorangehenden Teils (4) des Fötus bezüglich des vorher festgelegten Punkts auf den Hüftknochen der Mutter,

wobei das Mittel zum Erfassen des Ortes des vorangehenden Teils (4) des Fötus und der gegenüberliegenden Seiten des Gebärmutterhalses der Mutter umfasst:

einen Ultraschallwandler (40) zum Abbilden des vorangehenden Teils (4) des Fötus und des Gebärmutterhalses auf einem Bildschirm (42); und einen an den Ultraschallwandler (40) befestigten Positionssensor (PS5) zum Erzeugen eines seinen Ort identifizierenden Ausgangssignals an den Computer;

und die Vorrichtung umfasst ferner: ein Markiergerät zum Markieren eines ausgewählten Punktes des vorangehenden Teils (4) des Fötus und der gegenüberliegenden Seiten des Gebärmutterhalses der Mutter, wie abgebildet auf dem Bildschirm (42), und zum Ausgeben von elektrischen Signalen an den Computer (12), welche deren jeweiligen Orte bestimmen.

2. Vorrichtung nach Anspruch 1, ferner umfassend Mittel (PS3, PS4) zum Erfassen der Orte der gegenüberliegenden Seiten des Gebärmutterhalses der Mutter relativ zueinander zum Erzeugen von Ausgangssignalen, welche von dem Computer (12) empfangen und verarbeitet werden, um das Ausgabegerät (42) zum Ausgeben einer Indikation der Öffnung des Gebärmutterhalses der Mutter zu steuern.
3. Vorrichtung nach Anspruch 2, ferner umfassend Mittel (PS3, PS4) zum Erfassen der Orte der gegenüberliegenden Seiten des Gebärmutterhalses der Mutter bezüglich dem vorangehenden Teil (4) des Fötus und der Hüftknochen der Mutter zum Erzeugen von Ausgangssignalen, welche von dem Computer (12) empfangen und verarbeitet werden, um das Ausgabegerät (42) zum Ausgeben einer Indikation der Position des Gebärmutterhalses der Mutter zu steuern.
4. Vorrichtung nach Anspruch 2 oder 3, wobei das Mittel zum Erfassen der Orte der gegenüberliegenden Seiten des Gebärmutterhalses der Mutter einen dritten (PS3) und einen vierten (PS4) Positionssensor zum Befestigen an den gegenüberliegenden Seiten des Gebärmutterhalses der Mutter und zum Erzeugen von Ausgangssignalen an den Computer (12), welche deren jeweiligen Orte identifiziert, enthält.
5. Vorrichtung nach Anspruch 4, wobei der Computer (12) berechnet, und das Ausgabegerät (42) anzeigt, den Höhenstand des vorangehenden Teils (4) des Fötus als den räumliche Abstand zwischen dem ersten (PS1) und dem zweiten (PS2) Positionssensor.
6. Vorrichtung nach Anspruch 5, wobei der Computer (12) berechnet, und das Ausgabegerät (42) anzeigt, die Muttermundsweite des Muttermundes der Frau als den räumliche Abstand zwischen dem dritten (PS3) und dem vierten (PS4) Positionssensor.
7. Vorrichtung nach Anspruch 6, wobei der Computer (12) berechnet, und das Ausgabegerät (42) anzeigt, die Muttermundsweite und den Höhenstand in Zentimetern.
8. Vorrichtung nach Anspruch 6, wobei der Computer (12) berechnet, und das Ausgabegerät (42) anzeigt, die Muttermundsweite und den Höhenstand in Form eines Partogramms, welches den Zusammenhang der Muttermundsweite und das Absinken des vorangehenden Teils (4) des Fötus zeigt.
9. Vorrichtung nach einem der Ansprüche 4 bis 8, wobei der Computer (12) berechnet, und das Ausgabegerät (42) anzeigt, die Verkürzung des Hohlraums der Mutter als den räumlichen Abstand des zweiten Positionssensors (PS2) von dem dritten (PS3) und

vierten (PS4) Positionssensor.

10. Vorrichtung nach einem der Ansprüche 4 bis 9, wobei der Computer (12) berechnet, und das Ausgabegerät (42) anzeigt, die Position des Gebärmutterhalses der Mutter als die räumlichen Abstände zwischen dem ersten (PS1), zweiten (PS2), dritten (PS3) und vierten (PS4) Positionssensor.
11. Vorrichtung nach Anspruch 10, wobei die Verkürzung und Position des Gebärmutterhalses der Mutter in Zentimetern berechnet und angezeigt werden.
12. Vorrichtung nach einem der Ansprüche 4 bis 9, wobei der Computer (12) berechnet, und das Ausgabegerät (42) anzeigt, den Winkel der Gebärmutterhalsachse, wie angezeigt durch den zweiten (PS2), dritten (PS3) und vierten (PS4) Positionssensor.
13. Vorrichtung nach Anspruch 12, wobei, wenn der Markierer den biparietalen Durchmesser (BPD) des Kopfes (4) des Fötus, wie er auf dem Bildschirm (42) abgebildet ist, markiert, und der Computer (12) den Abstand zwischen den BPD und den Beckeneingang der Mutter berechnet.

Revendications

1. Appareil de contrôle de l'avancement du travail, caractérisé par :
 - un capteur de position (PS1) à rattacher à un point prédéterminé des os du bassin de la mère et servant à produire un signal de sortie identifiant sa localisation dans l'espace ;
 - un moyen (PS2) de détection de la localisation de la partie présentant le fœtus (4) par rapport audit point prédéterminé des os du bassin de la mère et servant à produire un signal de sortie identifiant la localisation de ladite partie présentant le fœtus (4), ledit moyen de détection de la localisation de la partie présentant le fœtus (4) en se référant audit point prédéterminé des os du bassin de la mère comprenant un deuxième capteur de position (PS2) à rattacher à la pointe extérieure de la partie présentant le fœtus pour produire vers l'ordinateur (12) un signal de sortie identifiant la localisation dudit deuxième capteur de position (PS2),
 - un ordinateur (12) connecté de manière à recevoir lesdits signaux de sortie ; et
 - un dispositif d'édition (42) commandé par ledit ordinateur (12) pour éditer la position de ladite partie présentant le fœtus (4) par rapport audit point prédéterminé des os du bassin de la mère, ledit moyen de détection de la localisation de la partie présentant le fœtus (4) et des côtés op-

- posés du col de l'utérus de la mère comprenant :
- un transducteur ultrasonique (40) pour illustrer en images ladite partie présentant le fœtus (4) et ledit col de l'utérus sur un écran (42) ; et un capteur de position (PS5) rattaché audit transducteur ultrasonique (40) pour produire un signal de sortie identifiant sa localisation en direction de l'ordinateur (12) ;
et ledit appareil comprenant un outre : un système de marquage pour marquer un point sélectionné de la partie présentant le fœtus (4) et les côtés opposés du col de l'utérus de la mère, comme illustré par des images sur l'écran (42) et pour éditer un signal électrique identifiant leurs localisations respectives en direction de l'ordinateur (12).
2. Appareil selon la revendication 1, comprenant en outre un moyen (PS3, PS4) de détection des localisations des côtés opposés du col de l'utérus de la mère les uns par rapport aux autres afin de produire des signaux de sortie qui sont reçus par ledit ordinateur (12) et traités dans le but de commander ledit dispositif d'édition (42) pour éditer une indication de la dilatation du col de la mère.
 3. Appareil selon la revendication 2, comprenant en outre un moyen (PS3, PS4) de détection des localisations des côtés opposés du col de l'utérus de la mère les uns par rapport à la partie présentant le fœtus (4) et aux os du bassin de la mère pour produire des signaux de sortie qui sont reçus par ledit ordinateur (12) et traités dans le but de commander ledit dispositif d'édition (42) pour éditer une indication de la position du col de la mère.
 4. Appareil selon la revendication 2 ou 3, dans lequel ledit moyen de détection des localisations des côtés opposés du col de l'utérus de la mère comprend un troisième (PS3) et un quatrième (PS4) capteurs de position à rattacher aux côtés opposés du col de l'utérus de la mère et servant à produire des signaux de sortie en direction dudit ordinateur (12) identifiant leurs positions respectives.
 5. Appareil selon la revendication 4, dans lequel ledit ordinateur (12) calcule et ledit dispositif d'édition (42) affiche la position de la partie présentant le fœtus (4) sous forme de distance spatiale entre lesdits premier (PS1) et deuxième (PS2) capteurs de position.
 6. Appareil selon la revendication 5, dans lequel ledit ordinateur (12) calcule et ledit dispositif d'édition (42) affiche la dilatation du col de l'utérus de la femme sous forme de distance spatiale entre lesdits troisième (PS3) et quatrième (PS4) capteurs de position.
 7. Appareil selon la revendication 6, dans lequel ledit ordinateur (12) calcule et ledit dispositif d'édition (42) affiche ladite dilatation du col et ladite position en centimètres.
 8. Appareil selon la revendication 6, dans lequel ledit ordinateur (12) calcule et ledit dispositif d'édition (42) affiche ladite dilatation du col et ladite position sous forme d'un partogramme montrant l'interrelation entre la dilatation du col et la descente de la partie présentant le fœtus (4).
 9. Appareil selon l'une quelconque des revendications 4 à 8, dans lequel ledit ordinateur (12) calcule et ledit dispositif d'édition (42) affiche l'effacement de la cavité de la mère sous forme de distance spatiale entre ledit deuxième (PS2) et lesdits troisième (PS3) et quatrième (PS4) capteurs de position.
 10. Appareil selon l'une quelconque des revendications 4 à 9, dans lequel ledit ordinateur (12) calcule et ledit dispositif d'édition (42) affiche la position du col de l'utérus de la mère sous forme de distances spatiales entre lesdits premier (PS1), deuxième (PS2), troisième (PS3) et quatrième (PS4) capteurs de position.
 11. Appareil selon la revendication 10, dans lequel ledit effacement et ladite position du col de l'utérus de la mère sont calculés et affichés en centimètres.
 12. Appareil selon l'une quelconque des revendications 4 à 9, dans lequel ledit ordinateur (12) calcule et ledit dispositif d'édition (42) affiche l'angle de l'axe cervical tel qu'indiqué par lesdits deuxième (PS2), troisième (PS3) et quatrième (PS4) capteurs de position.
 13. Appareil selon la revendication 12, dans lequel ledit marqueur marque le diamètre bi-pariétal (BPD) de la tête du fœtus (4) tel qu'illustré par une image sur l'écran (42) et ledit ordinateur (12) calcule la distance entre ledit BPD et l'entrée du bassin de la femme.

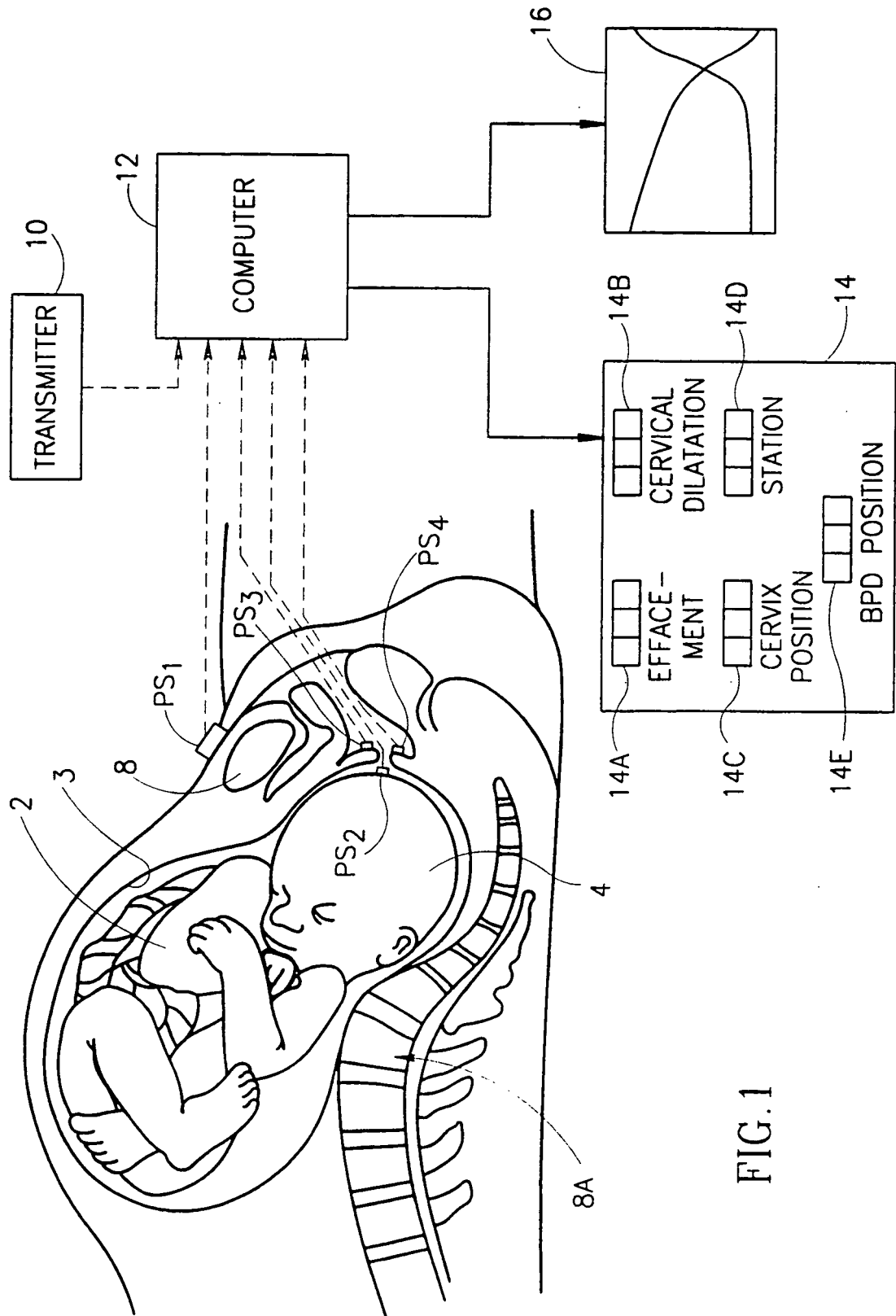


FIG. 1

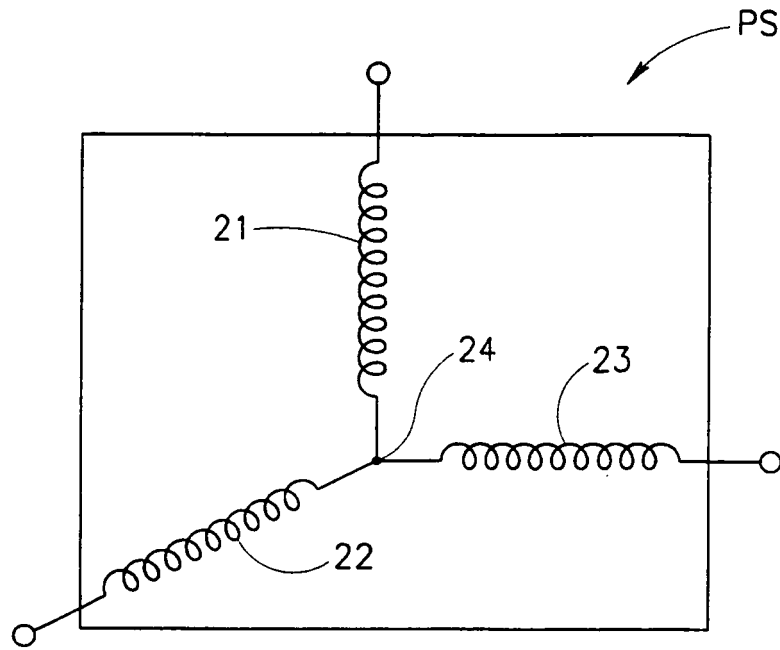


FIG. 2

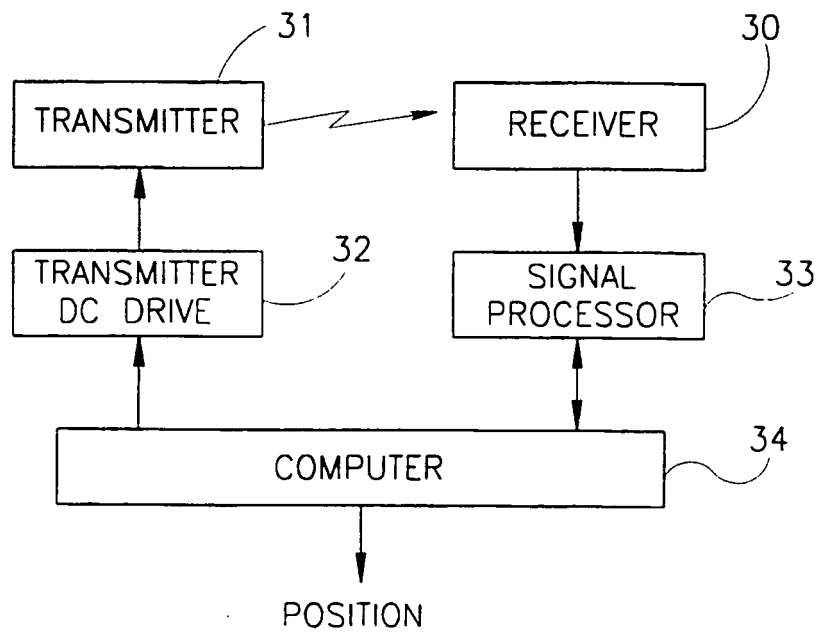


FIG. 3

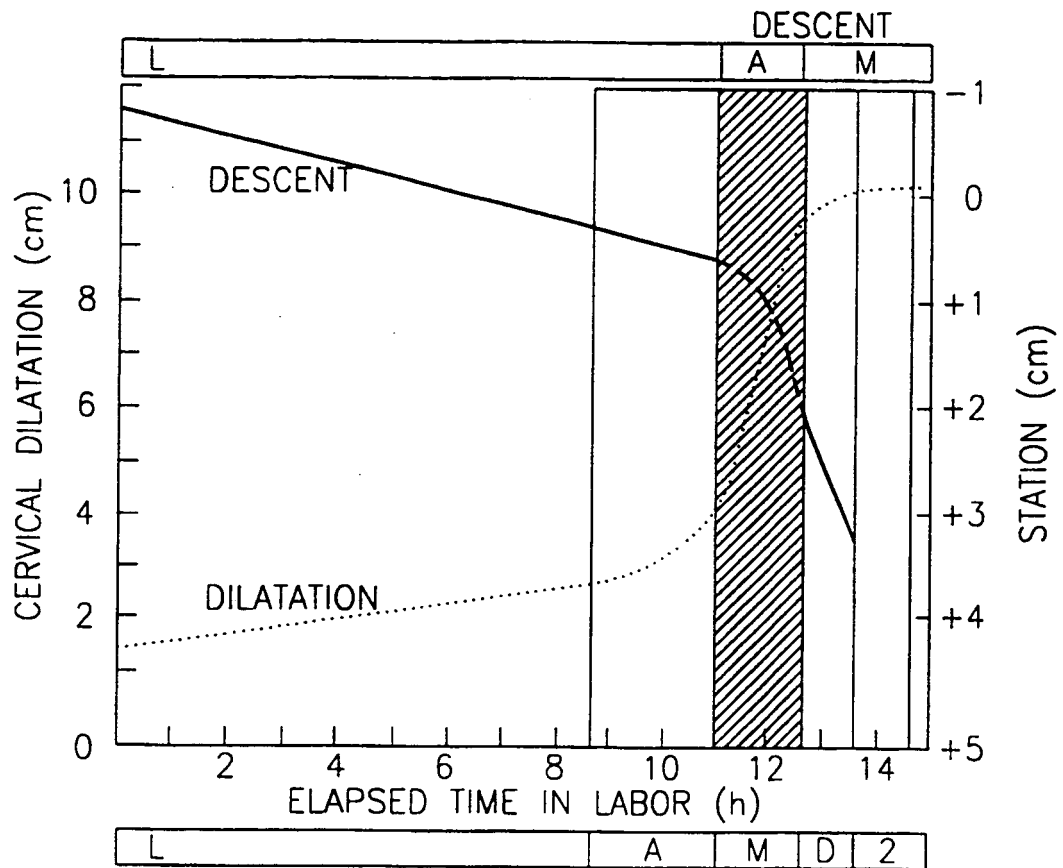


FIG.4

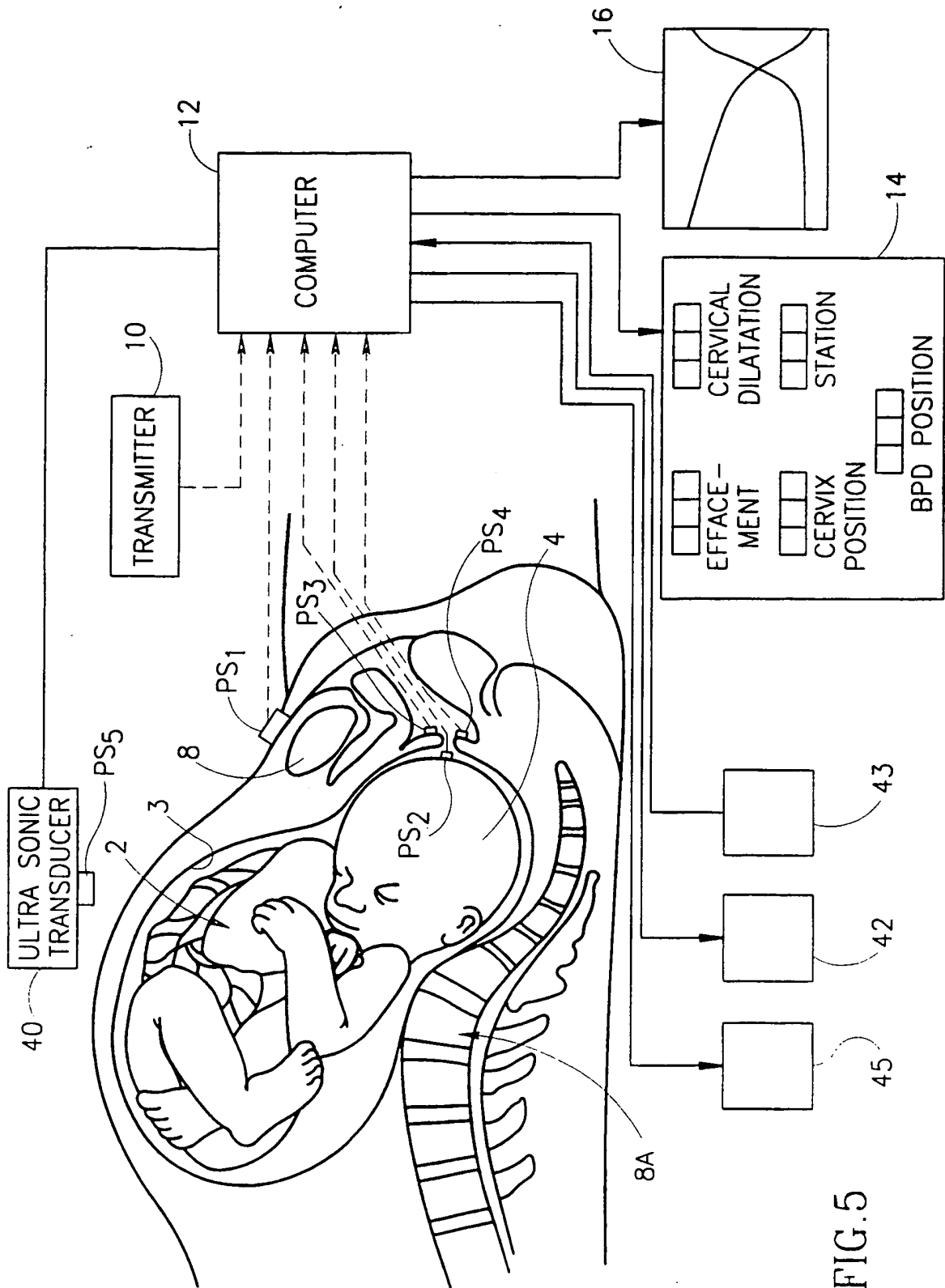


FIG. 5

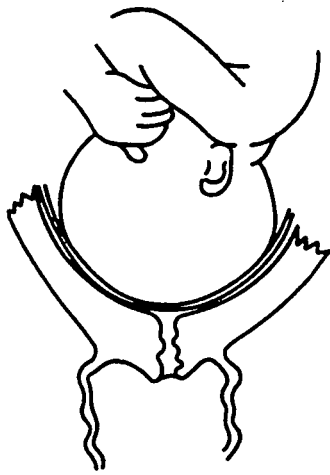


FIG. 6A

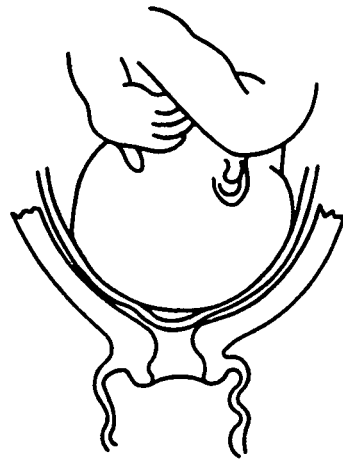


FIG. 6B

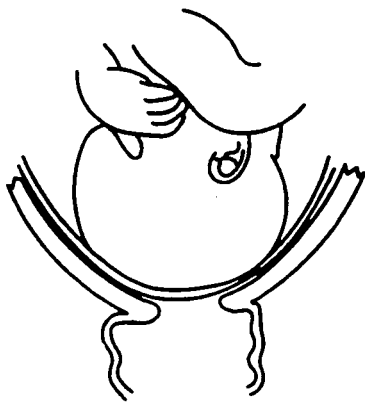


FIG. 6C



FIG. 6D

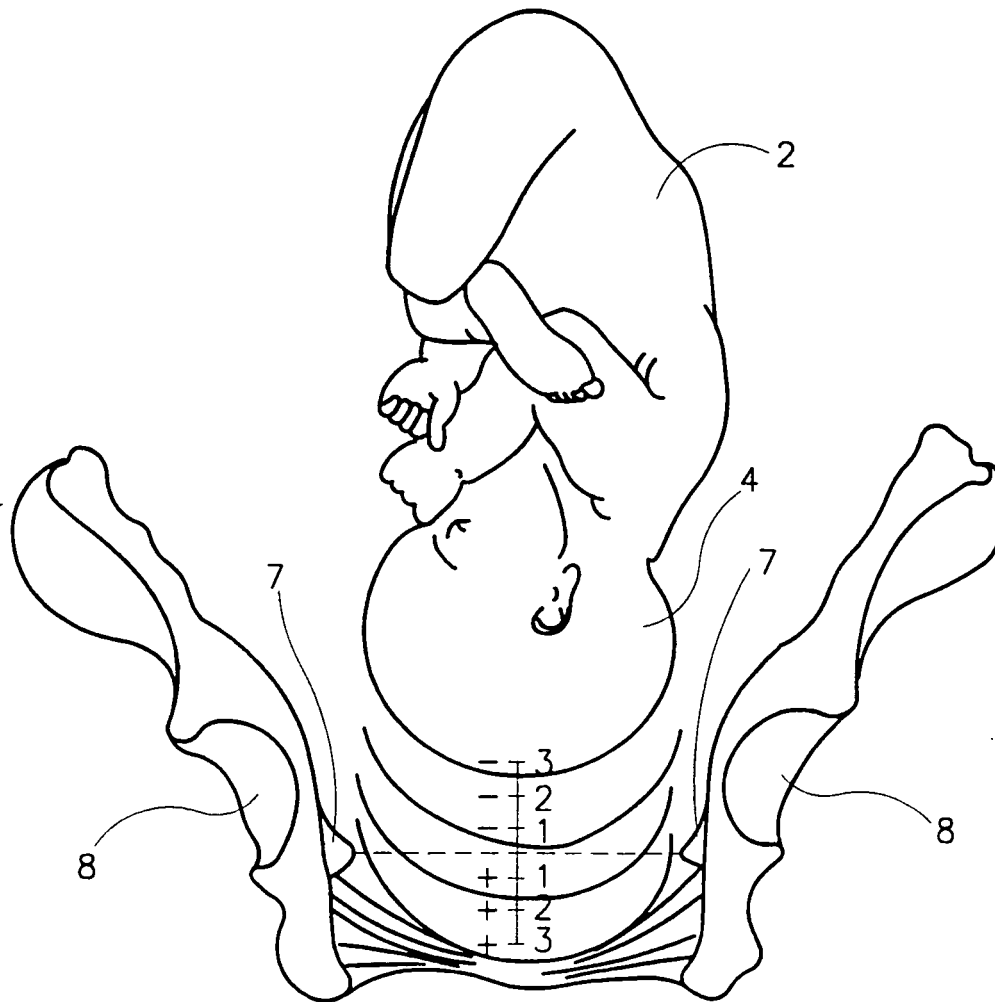


FIG. 7

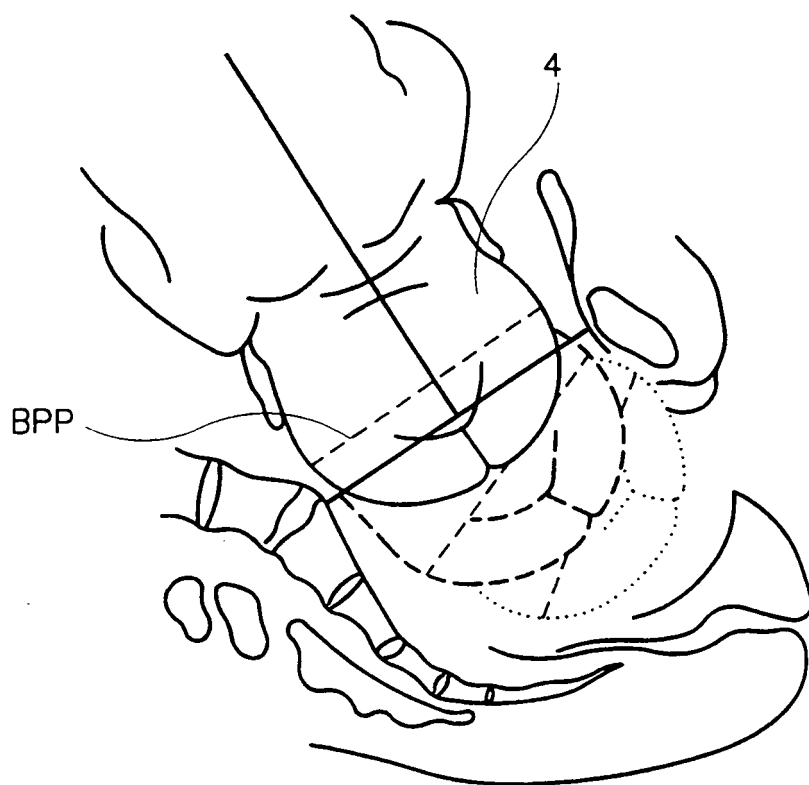


FIG. 8

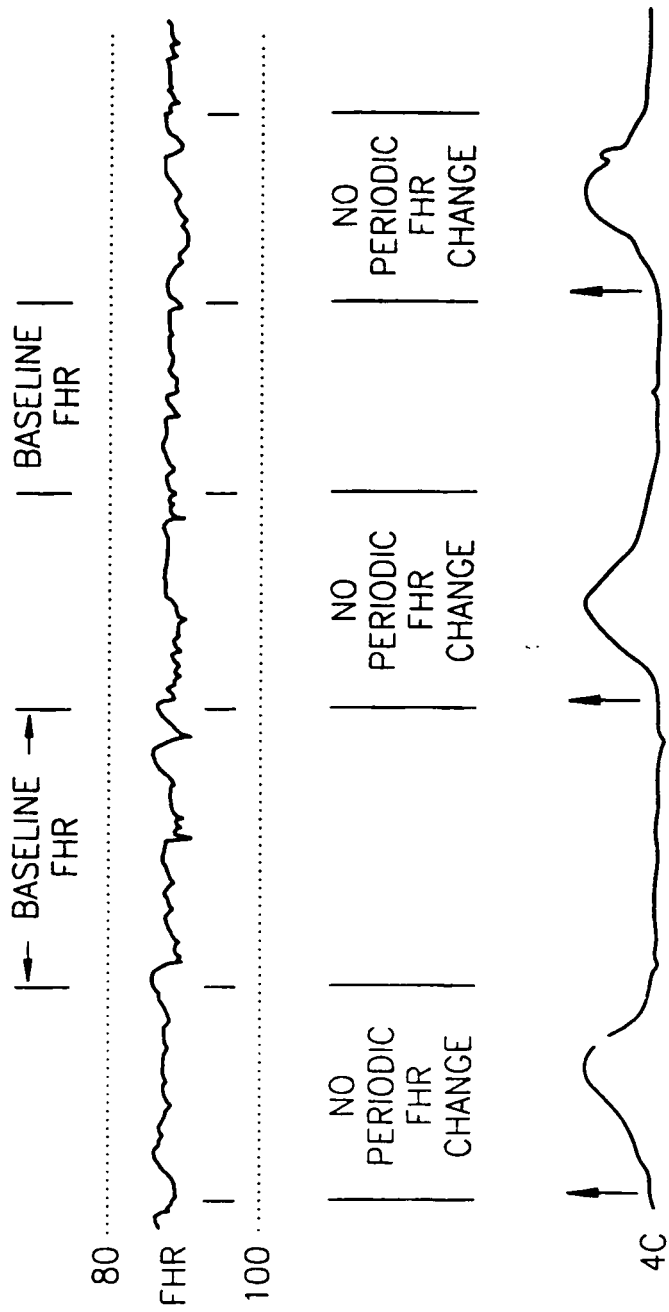


FIG.9

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 4476871 A [0005]
- US 4942882 A [0005]
- US 5135006 A [0005]
- US 5222485 A [0005]
- US 5406981 A [0005]
- DE 3103367 A1 [0006] [0007]
- US 5438996 A [0007]
- FR 2158767 A [0008]
- US 3788459 A [0009]